IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

5   Applicant(s): Sarraf et al.
     Case: 34-20
     Serial No.:   10/636,161
     Filing Date: August 7, 2003
     Group: 2616
10   Examiner: Phuongchau Nguyen

     Title: Method and Apparatus for Multi-Stream Transmission with Time and Frequency
                    Diversity in an Orthogonal Frequency Division Multiplexing (OFDM)
                    Communication System
15   _____

REPLY BRIEF

20   Mail Stop Appeal Brief – Patents
     Commissioner for Patents
     P.O. Box 1450
     Alexandria, VA 22313-1450

25
     Sir:

        Appellants hereby reply to the Examiner's Answer, mailed July 7, 2008 (referred
     to hereinafter as "the Examiner's Answer"), in an Appeal of the final rejection of claims 1-5, 7-
30   14, and 16-18 in the above-identified patent application.

REAL PARTY IN INTEREST

        A statement identifying the real party in interest is contained in Appellants'
     Appeal Brief.
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RELATED APPEALS AND INTERFERENCES

        A statement identifying related appeals is contained in Appellants' Appeal Brief.

STATUS OF CLAIMS

A statement identifying the status of the claims is contained in Appellants' Appeal Brief.

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STATUS OF AMENDMENTS

A statement identifying the status of the amendments is contained in Appellants' Appeal Brief.

SUMMARY OF CLAIMED SUBJECT MATTER

10   A Summary of the Invention is contained in Appellants' Appeal Brief.

STATEMENT OF GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A statement identifying the grounds of rejection to be reviewed on appeal is contained in Appellants' Appeal Brief.

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CLAIMS APPEALED

A copy of the appealed claims is contained in an Appendix of Appellants' Appeal Brief.

20   ## ARGUMENT

Point A

The Examiner asserts that Sinha discloses the claimed limitations of "allocating unique frequency partitions (low sidebands 102L & 104L and upper sidebands 102U & 104U) to each of the sub-streams (102L, 104L, 102U, 104U) for a plurality of consecutive time slots (i.e.,

25   channels may correspond to different time slots, col. 3, lines 5-6, which could be consecutive time slots), and allocating a unique timeslot (different timeslots, col. 3, lines 5-6) to each of the plurality of sub-streams (i.e., 102L, 102U, 104L, 104U sub-streams of channel partitions).

Appellants note that, in the text cited by the Examiner, Sinha teaches that "the channels may correspond to different frequency bands, time slots, code division slots or any other type of channels." Thus, while *different frequency bands* may be used (e.g., two frequency bands, where *each frequency band corresponds to two channels*), there is *no* teaching that *each*

5 *channel has a different frequency band or has a unique frequency band*, as would be apparent to a person of ordinary skill in the art.

In addition, the word "different" appears to be an adjective for the term "frequency band," but *not* for the remaining terms in the citation, as the phrase "different any other type of channel" appears to make no sense. Therefore, Sinha does *not* appear to teach

10 *different time slots*.

Finally, Appellants note that *no* disclosure or suggestion could be found in the Sinha quotation or in the Sinha reference of allocating **unique** *frequency partitions and* **unique** *timeslots*, or that sidebands 102L, 104L, 102U & 104U are **uniquely** allocated to **each** *channel*. In particular, Sinha does *not* disclose or suggest allocating a **unique** *frequency partition* to each

15 of the sub-streams for a plurality of consecutive time slots; **and** allocating a **unique** *time slot* to each of the plurality of sub-streams. Independent claims 1 and 10 require allocating a **unique** *frequency partition* to each of said sub-streams for a plurality of consecutive time slots; and allocating a **unique** *time slot* to each of said plurality of sub-streams.

Thus, Sinha does not disclose or suggest allocating a unique frequency partition to

20 each of said sub-streams for a plurality of consecutive time slots; and allocating a unique time slot to each of said plurality of sub-streams, as required by independent claims 1 and 10.

Point B

The Examiner asserts that Sinha discloses wherein no two sub-streams (i.e., 102L & 104L low sub-streams, 102U & 104U upper sub-streams) associated with the same audio

25 segment are transmitted in the same time slot (col. 5, lines 5-6, wherein the channels may correspond to different timeslots), and that, hence, each of 102L, 102U, 104L, 104U sub-streams of channels correspond to different timeslots, thus no sub-streams are transmitted in the same time slot.

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As noted above, Sinha does *not* appear to teach *different time slots.* In addition, Appellants could find *no* disclosure or suggestion in Sinha that *no two sub-streams associated with the same audio segment are transmitted in the same time slot.*

Point C

5   The Examiner asserts that FIGS. 1 and 2 of Sinha disclose wherein the characteristic of a particular channel or channels may be made to vary as a function of time (col. 9, lines 58-60); and channels corresponding to different time slots (col. 3, lines 5-6). The Examiner further asserts that Sinha discloses the claimed limitations wherein a unique timeslot (different time slots) is allocated to each of said sub-streams by introducing a delay (by varying a

10   particular channel or channels as a function of time, e.g., delaying in time) between each of said sub-streams (see, also, col. 6, lines 31-34, wherein the first channel comprises 102L & 104L sub-bands/streams, the second channel comprises 102U & 104U sub-bands/streams, and each of the sub-streams of the channels are being varied as a function of time, e.g., delaying in time).

      Regarding the Examiner's assertion that Sinha discloses the claimed limitation

15   wherein a unique timeslot is allocated to each of said sub-streams by introducing a delay, Appellants note that, in the text cited by the Examiner, Sinha teaches that "the channels may correspond to different frequency bands, time slots, code division slots or any other type of channels." As noted above, the word "different" appears to be an adjective for the term "frequency band," but not for the remaining terms in the citation. Thus, Sinha does *not* appear to

20   teach *different time slots.*

      Appellants also note that *varying a channel as a function of time* is *not* equivalent to *introducing a delay to allocate a unique timeslot to each sub-stream,* as would be apparent to a person of ordinary skill in the art. In any case, contrary to the Examiner's assertion, Appellants could find *no* disclosure or suggestion in the Sinha reference that a *unique time slot is allocated*

25   *to each of the sub-streams by introducing a delay between each of the sub-streams.*

      Thus, Sinha does not disclose or suggest wherein a unique time slot is allocated to each of said sub-streams by introducing a delay between each of said sub-streams, as required by claims 9 and 18.

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Appeal Brief Arguments

Independent Claims 1 and 10

Independent claims 1 and 10 are rejected under 35 U.S.C. §102(e) as being anticipated by Sinha. Regarding claim 1, the Examiner asserts that Sinha discloses allocating a

5   unique frequency partition to each of said sub-streams (102 & 104 L, 102 & 104 U - FIG. 2) for a plurality of consecutive time slots (FIGS. 1 and 2; col. 2, line 55; col. 3, line 22; col. 3, line 60, to col. 4, line 7); and allocating a unique time slot to each of said plurality of sub-streams (col. 3, line 22; col. 3, line 60, to col. 4, line 7; col. 5, lines 7-16). In the final Office Action, the Examiner asserts that the channels may correspond to different bands, timeslots (FIGS. 1 and 2;

10   col. 3, lines 5-6, and col. 6, lines 24-26).

In the text cited by the Examiner, Sinha mentions *time slots, code division multiple access (CDMA) slots, and virtual connections* (col. 3, line 60, to col. 4, line 13) and briefly mentions *channels* (col. 5, lines 7-23). Appellants, however, could find no disclosure or suggestion by Sinha of allocating ***unique*** *frequency partitions and* ***unique*** *timeslots*. In

15   particular, Sinha does *not* disclose or suggest allocating a ***unique*** *frequency partition* to each of the sub-streams for a plurality of consecutive time slots; ***and*** allocating a ***unique*** *time slot* to each of the plurality of sub-streams. Independent claims 1 and 10 require allocating a ***unique*** *frequency partition* to each of said sub-streams for a plurality of consecutive time slots; and allocating a ***unique*** *time slot* to each of said plurality of sub-streams.

20   Thus, Sinha does not disclose or suggest allocating a unique frequency partition to each of said sub-streams for a plurality of consecutive time slots; and allocating a unique time slot to each of said plurality of sub-streams, as required by independent claims 1 and 10.

Claims 8 and 17

Claims 8 and 17 are rejected under 35 U.S.C. §102(e) as being anticipated by

25   Sinha. Regarding claim 8, the Examiner asserts that Sinha discloses wherein no two sub-streams associated with the same audio segment are transmitted in the same time slot (col. 2, line 64, to col. 3, line 22; and FIGS. 1 and 2).

Appellants note that, in the text cited by the Examiner, Sinha teaches that *"the channels may correspond to different frequency bands, time slots, code division slots or any other type of channels."* (Col. 3, lines 5-7; emphasis added.) Appellants, however, could find *no* disclosure or suggestion in Sinha that *no two sub-streams associated with the same audio segment are transmitted in the same time slot.*

Thus, Sinha does not disclose or suggest wherein no two sub-streams associated with the same audio segment are transmitted in the same time slot, as required by claims 8 and 17.

Claims 9 and 18

Claims 9 and 18 are rejected under 35 U.S.C. §102(e) as being anticipated by Sinha. In particular, the Examiner asserts that Sinha discloses wherein a unique time slot is allocated to each of said sub-streams by introducing a delay between each of said sub-streams (col. 2, line 58, to col. 3, line 20; col. 9, lines 48-60).

In the text cited by the Examiner, Sinha teaches, for example, that

> in an illustrative embodiment, interference characteristics are determined for a set of n channels to be used to transmit audio information bits, where n is greater than or equal to two. The audio information bits are separated into n classes based on error sensitivity, for example, the impact of errors in particular audio data bits on perceived quality of an audio signal reconstructed from the transmission. The classes of bits are then assigned to the n channels such that the classes of bits having the greatest error sensitivity are transmitted over the channels which are the least susceptible to interference. The interference characteristics associated with the n channels can be determined by, for example, measuring interference levels at different times and locations for one or more of the channels, or obtaining information regarding known interference levels for one or more of the channels. *The channels may correspond to different frequency bands, time slots, code division slots or any other type of channels. The channel properties may also change with factors such as time and location within a coverage area.*
> In accordance with another aspect of the invention, the assignment of the classes of bits to the channels, as well as the characteristics of the classes and the channels, may be fixed or dynamic. For example, in applications in which the interference characteristics associated with one or more of the channels vary as a function of time, position within a coverage area, or other factors, the assignment of the classes of bits to the channels can be varied so as to ensure that

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the classes of bits having the greatest error sensitivity continue to be transmitted over the channels which are least susceptible to interference. As another example, amounts of channel resources used for particular classes of audio information bits can vary as a function of time.

5   (Col. 2, line 57, to col. 3, line 22; emphasis added.)

Appellants, however, could find *no* disclosure or suggestion in Sinha of a ***unique*** *time slot that is allocated to each of the sub-streams* ***by introducing a delay*** *between each of the sub-streams.*

Thus, Sinha does not disclose or suggest wherein a unique time slot is allocated to

10   each of said sub-streams by introducing a delay between each of said sub-streams, as required by claims 9 and 18.

Conclusion

The rejections of the cited claims under section 102 in view of Sinha are therefore

15   believed to be improper and should be withdrawn. The remaining rejected dependent claims are believed allowable for at least the reasons identified above with respect to the independent claims.

The attention of the Examiner and the Appeal Board to this matter is appreciated.

Respectfully,

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APPENDIX

1. A method of transmitting a plurality of sub-streams in a multi-stream digital audio broadcasting system, said method comprising the steps of:

allocating a unique frequency partition to each of said sub-streams for a plurality of consecutive time slots;

allocating a unique time slot to each of said plurality of sub-streams; and

transmitting said sub-streams to a receiver.

2. The method of claim 1, wherein said sub-streams include at least two core streams and at least two enhancement streams.

3. The method of claim 2, wherein said core sub-streams have a maximum separation in the time domain.

4. The method of claim 2, wherein said multi-stream digital audio broadcasting system is an all-digital IBOC (In-Band-On-Channel) system and said core sub-streams have a maximum separation in the frequency domain.

5. The method of claim 2, wherein said multi-stream digital audio broadcasting system is a hybrid IBOC (In-Band-On-Channel) system and said core sub-streams are transmitted in the frequency domain in the innermost side bands.

6. The method of claim 2, wherein said multi-stream digital audio broadcasting system is an all-digital IBOC (In-Band-On-Channel) system and each of said core sub-streams has a maximum separation from one of said enhancement sub-streams in the frequency domain and a maximum separation from the other enhancement sub-stream in the time domain.

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7. The method of claim 2, wherein said multi-stream digital audio broadcasting system is an all-digital IBOC (In-Band-On-Channel) system and said core sub-streams are separated by a data stream.

5   8. The method of claim 1, wherein no two sub-streams associated with the same audio segment are transmitted in the same time slot.

9. The method of claim 1, wherein a unique time slot is allocated to each of said sub-streams by introducing a delay between each of said sub-streams.

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10. A transmitter in a multi-stream digital audio broadcasting system, comprising:

a modulator for allocating a unique frequency partition to each of two or more sub-streams for a plurality of consecutive time slots;

a delay circuit for allocating a unique time slot to each of said two or more sub-

15   streams; and

a transmitter for transmitting said two or more sub-streams to a receiver.

11. The transmitter of claim 10, wherein said two or more sub-streams include at least two core streams and at least two enhancement streams.

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12. The transmitter of claim 11, wherein said core sub-streams have a maximum separation in the time domain.

13. The transmitter of claim 11, wherein said multi-stream digital audio

25   broadcasting system is an all-digital IBOC (In-Band-On-Channel) system and said modulator provides a maximum separation of said core sub-streams in the frequency domain.

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14. The transmitter of claim 11, wherein said multi-stream digital audio broadcasting system is a hybrid IBOC (In-Band-On-Channel) system and said modulator allocates said core sub-streams in the frequency domain to the innermost side bands.

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15. The transmitter of claim 11, wherein said multi-stream digital audio broadcasting system is an all-digital IBOC (In-Band-On-Channel) system and each of said core sub-streams has a maximum separation from one of said enhancement sub-streams in the frequency domain and a maximum separation from the other enhancement sub-stream in the time domain.

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16. The transmitter of claim 11, wherein said multi-stream digital audio broadcasting system is an all-digital IBOC (In-Band-On-Channel) system and said core sub-streams are separated by a data stream.

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17. The transmitter of claim 10, wherein no two sub-streams associated with the same audio segment are transmitted in the same time slot.

18. The transmitter of claim 10, wherein a unique time slot is allocated to each of said two or more sub-streams by introducing a delay between each of said two or more sub-

20 streams.

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EVIDENCE APPENDIX

There is no evidence submitted pursuant to § 1.130, 1.131, or 1.132 or entered by the Examiner and relied upon by appellant.

RELATED PROCEEDINGS APPENDIX

There are no known decisions rendered by a court or the Board in any proceeding identified pursuant to paragraph (c)(1)(ii) of 37 CFR 41.37.